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ABSTRACT

While men and women in 1987 may be able to achieve equally in academic settings, gender differences in affective and value factors associated with achieving academically may exist. Differences in the values attached to academic achievement and thus the motivation behind achievements, and feelings about the situation in which education takes place are especially important when individuals enter a new educational environment. A study was conducted to test the hypothesis that men's academic achievement is better predicted from indicators of prior achievement, mastery-related expectations, and mastery-oriented values, while women's achievement is better predicted from person-related values and evaluations of the atmosphere in the academic program. Subjects were 160 male and 90 female students enrolled in Inteflex, an integrated bachelor of arts-doctor of medicine program at the University of Michigan. Academic achievement was measured by total scores on the National Board of Medical Examinations-I; mastery-related and person-oriented values were assessed through self-administered questionnaires; and prior achievement was assessed using high school data and Scholastic Aptitude Test scores. The results of regression analyses support the hypothesis, suggesting that men's and women's academic achievement arise out of different motivations and are influenced by different factors. (Author/NB)

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Gender Differences in Academic Achievement - The Result of Cognitive or Affective Factors?

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Abstract

Gender differences in academic achievement in an integrated A.B.-M.D. program at the University of Michigan in Ann Arbor (Inteflex program) are investigated. We argue that men's achievement is best predicted from indicators of prior academic achievement such as high school GPA, and of academic aptitude such as SAT scores, as well as indicators of mastery-related values. Women's achievement on the other hand is best predicted from person-related values and evaluations of the atmosphere in the program. Data from 160 male and 90 female Inteflex students were analyzed. The results of regression analyses support our hypotheses. We conclude that men's and women's academic achievement arise out of different motivations and are influenced by different factors.

Introduction

The development of research on gender differences in academic achievement is closely tied to public opinion and prejudices on one hand and to the mainstream thoughts in psychology on the other hand. The research so far can be categorized under three headings, starting with (1) research that "demonstrated" the intellectual inferiority of women, followed by (2) a stage of research in which differences in academic achievement were interpreted as a function of differences in cognitive factors such as differences in expectations to succeed and in attributions for success and failure, and finally leading to (3) a stage in which affective and value factors are examined as being important to the understanding of gender differences in academic achievement.

This paper contributes to research in this third stage. We argue that women and men in 1987 are very well able to achieve equally in academic settings, but that there are gender differences in affective and value factors associated with achieving academically. These factors are (1) the values attached to academic achievement and thus the motivation behind achievements, and (2) feelings about the situation in which education takes place. We argue that male and female achievement can be predicted by using different indicators. These differences are especially important when individuals enter a new educational environment. We predict that in a new setting men's achievement is best predicted from earlier indicators of academic achievement and from mastery-oriented values, whereas women's achievement is best predicted from person-oriented values and from their evaluations of the

atmosphere in the new environment. The main goal of this paper is to demonstrate that we need to better understand motivations that lead to achievement and that only by taking these affective and value factors into account will we get closer to explaining the sources of gender differences in academic and professional achievement. Furthermore, when men and women do equally well academically or professionally, their achievement may be due in part to different factors.

In the first stage of research on gender differences in academic achievement, women were considered to be intellectually inferior to men. This view persisted throughout the nineteenth century and lasted well into the early decades of this century (Miles, 1935; Cole, 1979). This research mirrored the general stereotypes of the public concerning gender differences and was influenced by a nativist point of view in psychology.

Greater opportunities for the education of women with the opening up of college education for women in the 1870s and the 1912 law mandating universal compulsory education helped to gradually change the prevailing stereotypes. By the late 1970s, the proportions of men and women enrolling in colleges had become equal (Social Indicators of Equality for Minorities and Women, 1978). Despite comparable enrollment, men more often completed their baccalaureate degrees than did women, and continued to dominate fields such as architecture, business, engineering, and the physical sciences (Stockard et. al., 1980). These gender differences in achieving in different fields and in choosing different careers were important in bringing about the second stage of research on gender differences and academic achievement. On the level of public opinion, the women's movement re-emerged in the late 1960s and promoted more egalitarian views. At the same time, a cognitive perspective became dominant in psychological research. Thus, research in the second stage

focused on the influence of cognitive factors such as expectations and attributions of success and failure on academic achievement.

The main perspective in this second stage was that men and women have the same potential to achieve and are equally talented, but that women are socialized to have lower expectations of success especially in traditionally male fields and to have different attributions of success and failure than are men. Gender differences in academic achievement were thus interpreted as a function of differences in cognitive factors (Dweck & Licht, 1980).

In the 1980s the third stage of research began. Psychology is still dominated by a cognitive perspective on behavior, but affective factors have begun to win back legitimacy (Zajonc, 1980). At the same time, a shift in cultural values from materialistic to post-materialistic values continues (Inglehart, 1981). The public is more accepting of values that are not materialistic and achievement related, but rather are person-oriented and focus on personal fulfillment. In this social and scientific climate a new look at gender differences in academic achievement is possible. Men and women may well have the same expectations to succeed, but choose different fields because they have different values and interests in life. And, when women choose the same fields as men, they may have quite different motivations (Eccles, 1986a, 1986b). Men and women might also differ in the way they react to different environments, e.g., to competitive versus cooperative classrooms (Eccles, MacIver & Lange, 1986). While men thrive in competitive settings, women may do less well academically due to their evaluation of the competitive atmosphere.

In addition to an increased interest in affective and value factors, researchers have found that gender differences in fields such as math do not occur under all circumstances. Hogrebe (1987) has noted that gender

differences in math scores ares related to sample characteristics and the particular variables considered. Therefore, a better understanding of the ways to achievement that men and women take is needed.

Our general hypothesis is that academic achievement of women and men can be explained by taking different factors, primarily affective and value factors, into account. Analyses of gender-role stereotypes help us to predict more precisely how men and women might differ in their motivations (Spence, Deaux & Helmreich, 1985). A large number of studies indicate that men value mastery-related issues more than women, whereas women have more social and person-oriented values than men (Eccles, 1986b). We argue that these values are differentially associated with the achievement motivations: Men's performance is therefore best predicted from mastery-related values and indicators of abilities and prior achievement; women's achievement is best predicted from person-oriented values. Furthermore, if women are more affiliative and less power-oriented than men, women's academic achievement will be negatively related to perceptions of competitiveness and positively associated with perceptions of a warm and caring atmosphere. In contrast, men's achievement will not be affected by such perceptions of the atmosphere.

Our specific hypotheses are that men's academic achievement is better predicted from indicators of prior achievement, mastery-related expectations, and values than women's achievements. Women's achievement is better predicted from their person-oriented values and evaluations of the atmosphere in the academic program.

We tested these hypotheses in a longitudinal study of students in an integrated A.B.-M.D. program at the University of Michigan (Inteflex Program). We argue that men and women <u>entering</u> the program are selected carefully. Therefore, they do not necessarily differ in their grades,

expectations, values and evaluations of the program upon entering. However, after they are in the program for four years, there is a significant difference in academic achievement: Men score significantly higher than women in a nation-wide standardized medical examination (National Board of Medical Examination = NBME-I). We will determine whether this difference in achievement can be explained by the affective and cognitive factors proposed.

Specifically, we tested whether the male students' NBME-I total scores are better predicted than female students' scores by (1) prior academic achievement scores (high school GPA, high school percentile ranks), (2) indicators of abilities (SAT scores), (3) mastery-related expectations, and (4) mastery-related values, and whether the female students' scores are better predicted than the male students' scores by person-related values and the evaluation of the atmosphere in the academic program.

Method

Data from the 250 (160 male and 90 female) participants of the classes entering in 1975 through 1979 in the Inteflex Program at the University of Michigan are analyzed. The indicator of academic achievement used is the total score in the National Board of Medical Examinations-I (NBME-I). This examination was given in the fourth year of the Inteflex program. Indicators of mastery-related and person-oriented values, of evaluations of the atmosphere in the program, and mastery related expectations were obtained from self-administered questionnaires completed by the students in the first and second year of the program. Indicators of earlier academic achievement and abilities were high school grades, high school percentile rank, Verbal, Math,

and Total SAT scores. The assunmption that men and women did not differ significantly when entering the program was tested with anlyses of variance. The hypotheses about the different predictors for academic achievement in the Inteflex program of men and women were tested in regression analyses.

Results

Table 1 presents the average scores of Inteflex men and women on the NBME-I. Men do significantly better than women in all but one of the subtests of this examination.

As a first step in understanding these score differences, we determined whether male and female students entering the Inteflex program differed in their grades, their expectations, their values, and their evaluations of the program. As can be seen in Table 2a, men and women did not differ significantly in their high school GPA, their verbal, and their total SAT scores. Women had significantly higher high school percentile ranks than men; men had significantly higher math SAT scores. On the whole, these findings support our contention that male and female students were selected carefully and had excellent academic achievements prior to entering the Inteflex program.

The men and women entering the Inteflex program also did not differ significantly in their expectations concerning their future career. Both men and women did not consider many fields besides medicine in the few months before entering the program (1 = medicine is the only field considered, to 5 = four or more fields besides medicine were considered), they were not significantly different in expecting that medicine would be a very satisfying

career (1 = It's the only career that could really satisfy me, to 5 = It's a career that I probably won't find satisfying) and they were not significantly different in the certainty with which they chose medicine as a career (1 = very certain, to 5 = not at all certain) (see Table 2b).

The male and female students also did not differ significantly in the values with which they started the program. Both groups saw medicine as a good opportunity to help others, found political and social activities equally important, and also rated the importance of intellectual activities equally high (see Table 2c).

However, there were some gender differences in the evaluations of the program (see Table 2d). Women saw the Medical School as a more serious and hard-working environment than men, and they tended to see Inteflex students as more satisfied and more helpful to each other than did men. Women also tended to evaluate the Inteflex faculty as having more empathy than did the male participants in the program. On the other hand, the two groups did not significantly differ on other evaluations of the program such as the degree to which the Inteflex program assists students or stresses humanitarian service.

To summarize our first findings, the men and women entering the program were a rather homogeneous group. Men had significantly higher Math SAT scores, and women had significantly higher high school percentile ranks. However, the two groups did not differ in their high school GPA, the total SAT, and the verbal SAT scores, nor in their expectations concerning medicine as a career or nor in their values. They did differ in some evaluations of the program. Thus, the students in this program were selected carefully and the men and women entered the program as a rather homogeneous group.

In the second step in our analyses, we used indicators of prior academic achievement, expectations, values, and evaluations to test our hypotheses that

the male students' achievement is predicted from different indicators than is the women's achievement. Regression analyses were used to assess the predictive power of the various indicators.

As can be seen in Table 3a, our hypothesis that men's academic achievements is better predicted from prior academic achievement is partly supported. High school GPA and high school percentile rank were significant predictors for men's but not for women's later academic success. Verbal SAT scores and Total SAT scores were significant predictors for both groups' academic achievement; math SAT scores did not predict achievement in the NBME-I for either group.

Table 3b presents the results of regression analyses with expectations as predictors of achievement. Men's achievement was a clear function of their mastery-related expectation that medicine is the only career they have considered. The more they see medicine as the only career, the better they do academically. This mastery-related expectation did not contribute significantly in accounting for women's achievement. However, the emotion-related expectation that medicine will be satisfying as a career was related to women's scores. The more a female student idealized medicine as the most satisfying career, the worse the academic outcome was. This predictor was not significantly associated with men's achievement. Among the male students, a cognitive discrepancy in expectation may be stimulating their academic success. A higher certainty in career choice for men was related to a worse academic achievement.

In Table 3c, there is support for our hypothesis that women's achievement is associated with their person-related values. The more a woman saw medicine as an opportunity to help others, the better her academic achievement was.

Finally, Table 3d presents the impact of the evaluations of the program

on later academic achievement of men and women. Evaluating the medical school as a serious and hard working environment and believing that Inteflex students are satisfied and helpful to each other, and that cultural activities are important for them are significant predictors of female students' success, but not of male students' success. Furthermore, evaluating the Inteflex program as stressing humanitarian service, and the Inteflex faculty as having clear expectations are also significant predictors of women's but not of men's success. In contrats, seeing Inteflex students as stressing professional knowledge and Inteflex faculty as having empathy are significant predictors of men's but not women's success. Surprisingly, we find that for both groups an evaluation of the Inteflex program as assisting the students has a negative impact on their achievement. This finding might be due to the fact that only weaker students are in need of assistance and report assistance more than stronger students.

On the whole, these multiple regression analyses support our argument.

In the last step of our analyses, all indicators significantly related to men's academic achievement and all indicators that significantly predicted women's achievement were used in stepwise regression analyses with forward selection. Table 4 presents the results for the male students and Table 5 presents the results for the female students.

For both male and female students, the first predictor selected was the GPA in the second year of the program. The higher the students' GPA in the second year were, the better was their academic achievement in the fourth year. For both groups, the likelihood to enter surgery also predicted significantly the academic achievement in the fourth year.

For the male students, an evaluation that the program is balanced, that there is sufficient counseling for personal problems available,and that

faculty members are available for consultations were significantly related to achievement in the fourth year. It is remarkable that an evaluation of the medical school as not being independent and not being free would enhance the male students achievement. Furthermore, the men's Verbal SAT scores were a significant predictor of their academic achievement (see Table 4).

For women our prediction concerning the importance of evaluations of the atmosphere of the program is supported by this analysis: The less the women think that the Inteflex faculty stresses competition and the less intimidated they are by thinking that the students in the program are of high quality, the better their achievement was. The degree to which the women stress that they want to prepare for a career was also a significant predictor for later academic success.

In summary, our results, we found that men and women did not differ in some indicators of academic achievement and abilities, in their career expectations, values, and most evaluations of the program when entering the Inteflex program. Thus, the selection of male and female students was carefully conducted and led to a relatively homogeneous group starting the program. After four years in the program, there is a dramatic difference between men's and women's achievement: Women score significantly lower than men on the NBME-I. What happened to the homogeneous group entering the program in these four years?

We argue that men and women are motivated to achieve <u>partly</u> by different factors. Our regression analyses support this hypothesis. While both men's and women's success in the fourth year was predicted from academic achievement in the program (2nd year GPA) and a mastery-related value (the likelihood to enter surgery as a specialty), women's achievement was clearly a function of their evaluations of the program as competitive. Men score better when they

see the environment as less independent and free.

Conclusions

How do we interpret our findings? We see them as support for our suggestion to consider value and affective factors when studying gender differences in academic achievement. It is clear from our analysis that abilities measured prior to entering the new environment (Verbal SAT and Total SAT scores) are strong predictors of later academic achievement. But indicators of academic achievement in another environment (high school grades and high school percentile rank) are only significant predictors for the male, but not for the female students' later achievement. The change in the environment seems to be a very important factor for the women.

Those women who did achieve well in the new environment (GPA 2nd year) and who took on mastery-related values (preparing for career is important; likelihood to enter surgery as a specialty field) were more successful academically later. But on the whole, women's academic achievement was clearly a function of their evaluation of the competitiveness of the environment. If women felt that the faculty stresses competition and that the other students are of very high intellectual quality, they clearly achieved less well. Men on the other hand seemed to strive when they evaluate an atmosphere as not being independent and not being free.

In this paper we studied achievement in a genuinely academic field. We found that for both men and women cognitive abilities do predict later achievement, also this is true for men to an even larger degree than for women. We also found that women with mastery-related values tended to do

better. But most importantly we found that women who perceive the environment as competitive do less well.

What are the implications of our findings for gender differences in achievement in general? At this point we want to describe some results from another study (Oggins, Inglehart, Brown & Moore, under review) in which we analyzed gender differences in clinical performance ratings of Medical school students. In a study of male and female medical students at the University of Michigan, we found that women received significantly higher ratings on their clinical performance than did the male students. We found clear support for our hypothesis that men's and women's success was related to different values and to different evaluations of the atmosphere in the program. Even more than in the here presented results we found in this analysis that women's person related values predicted significantly how well they performed, while men's mastery related values predicted their success. Again, women's evaluations of the environment as being competitive was detrimental for their achievement.

Taking the results of these two studies together, we suggest the following two general points: Women do not do as well when they perceive the environment as competitive. These women may well find less competitive educational settings and less competitive professional environments as more conducive to achieving their potential.

Secondly, when women choose a competitive environment such as Medical Schools, the particular area of achievement is crucial in predicting their achievement relative to men. In a person-related area such as in clinical training, women may do better than men. And their success is clearly associated with person-related values. In an academic field such as the NBME-I assesses, women may not do as well as men, because their main source of motivation, their person-related values, does not apply to these purely

academic issues. If they adopt mastery-related values, their chances to succeed rise.

We believe that in a society whose values change from being predominantly materialistic and achievement oriented to more post materialistic and person-oriented values women may find it easier to succeed due to person-oriented values than in the past. The less competitive our environments would be, the more chances women will have to live up to their potential.

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Table 1: Gender differences in the National Board of Medical Examinations Test I (NBME-I)

NBME-I:	male	female
Anatomy	494	454**
Physiolog	551	500***
Biochemistry	564	523***
Pathology	503	455**
Microbiology	530	468***
Pharmacology	583	531***
Behav. Science	546	544ns
Total Score	549	496***

Table 2: Gender differences when entering the program

Table 2a: Gender differences in the average High School grades and SAT scores

	Men	Women	
High School GPA	3.96	3.90	ns
High School % rank	97.4	98.2	*
Verbal SAT	654.9	660.1	ns
Math SAT	717.8	696.2	**
Total SAT	1372.7	1356.3	ns

Table 2b: Gender differences in general expectations

Items:	Men	Women	
How many other fields?	1.64	1.84	ns
Is medicine only career?	1.83	1.79	ns
How certain about medicine?	1.24	1.20	ns

Table 2c: Gender differences in average values

	Men	Women	
opportunity to help others	1.53	1.40	ns
importance of intellectual activities	1.95	1.82	ns
importance of political / social activities	2.88	2.98	ns

Note: All answers are given on rating scales ranging from 1 = very important to 5 = not at all important.

Table 2d: Gender differences in the average evaluations of the program

	Men	Women	
Medical School:			
serious, hard working	2.33	2.12	.04
Inteflex program:			
stresses humanitarian service	1.63	1.54	ns
assists students	1.69	1.77	ns
Inteflex students:			
satisfied	1.50	1.36	.06
help each other	2.19	2.01	.10
professional knowledge is important	1.33	1.23	ns
cultural activity is important	2.19	2.26	ns
Inteflex faculty:			
clear in expectations	2.21	2.11	ns
empathy is important	1.93	1.74	.09

Note: All answers are given on rating scales ranging from 1 = very much to 5 = not at all.

Table 3: Regression analyses of NBME-I Total scores of male and female Inteflex students using grades, expectations, values and evaluations as predictors

Table 3a: Indicators of prior academic achievement

Predicting:	Men's NBME-I Total scores	Women's NBME-I Total scores
High School GPA	.17	ns
High School % rank	.15	ns
Verbal SAT	.26	.25
Math SAT	ns	ns
Total SAT	.25	.25

Table 3b: Expectations in first year

Predicting:	Men's NBME-I Total scores	Women's NBME-I Total scores
medicine is only field	-.14	ns
very certain about medicine	.19	ns
medicine will satisfy	ns	.21

Table 3c: Values

Predicting	Men's NBME-I Total scores	Women's NBME-I Total scores
opportunity to help others	ns	-.28
importance of intellectual activity	ns	ns
importance of political / social actions	ns	ns

Note: Answers were given on rating scales ranging from 1 = very much to 5 = not at all.

Table 3d: Evaluations of program in first year

Predicting:	Men's NBME-I Total scores	Women's
Medical School:		
serious, hard working	ns	-.25
Inteflex students:		
satisfied	ns	-.29
help each other	ns	-.39
professional knowledge is important	-.20	ns
cultural activity is important	ns	-.20
Inteflex program:		
stresses humanitarian service	ns	-.30
assists students	.24	.27
Inteflex faculty:		
clear in expectations	ns	-.27
empathy is important	-.20	ns

Note: All answers are given on rating scales from 1 = very much to 5 = not at all.

Table 4: Stepwise regression of the men's NBME-I Total scores using forward selection:

Step		R-Square	Partial	p
1	2nd Year: GPA (1=3.9-4.0 to 8=1.8+<)	.31612	-.56225	.0000
2	2nd Year: program is balanced	.35416	-.23583	.0071
3	2nd Year: Medical School is independent and free	.39715	.25800	.0033
4	1st year: sufficient counseling for personal problems is available	.41957	-.19287	.0298
5	1st year:likelihood to enter surgery	.45255	-.23835	.0072
6	Verbal SAT	.47009	.17903	.0457
7	1st year: faculty members are available for consultations	.48965	-.19212	.0325

N = 130 (out of 160); DF = 7 / 122; F = 16.722; p = .0000;
Multiple R = .69975; R-Square = .48965; SE= 78.361

Note: All answers were given on rating scales from 1 = very much to 5 = not at all.

Table 5: Stepwise regression of the women's NBME-I Total scores using forward selection

Step		R-Square	Partial	p
1	2nd year: GPA (1=3.9-4.0 to 8=1.8+<)	.20067	-.44797	.0001
2	1st year: faculty stresses competition	.26970	.29387	.0129
3	2nd year: preparing for career	.32064	-.26409	.0272
4	1st year: likelihood to go into surgery	.36025	-.24147	.0456
5	1st year: students in program are of high quality	.40917	.27653	.0224

N = 72 (out of 90); DF = 5 / 66; F = 9.1415; p = .0000;
Multiple R = .63966; R-Square = .40917; SE = 70.388

Note: Answers were given on rating scales ranging from 1 = very much to 5 = not at all.